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Family PHALLACEÆ.

37. *Phallus ravenelii* B. & C.

During the spring and early summer, and again after the rains of early autumn, this species was abundant on lawns in Lawrence, and, according to Prof. W. B. Wilson, also at Ottawa. Unlike this species in more eastern states, there was very little of the fœtid odor given off, frequently not enough to make the plants unpleasant out of doors.

Family PHOMATACEÆ.

38. *Septoria gaurina* E. & K.

On *Gaura parviflora* Dougl. Common and to a considerable extent defoliating the host.

39. *Septoria convolvulæ* Desmaz.

On *Convolvulus sepium* L. Common and causing some damage to the host.

40. *Septoria Lactucæ* Pass.

On *Lactuca scariola* L. Abundant on this weed.

Family MELANCONIACEÆ

41. *Colletotrichum gramineum* (Gesati) G. W. Wilson.

On *Hordeum pusillum* L. Abundant on this host, and probably also on other grasses.

Family MONILIACEÆ.

42. *Ramularia decipiens* E. & E.

On *Rumex crispus* L. Conspicuous and common on this host, and probably also on other species of the genus.

43. *Cercospora œnotheræ* E. & E.

On *Anogra albicaulis* (Pursh.) Small. Defoliating a cultivated clump of the host plant.

Edible Mushrooms of Kansas.

ELAM BARTHOLOMEW.

It is often too true, "In the course of human events," that he whose knowledge is the most superficial in a given line of attainment is usually the one who can speak, and sometimes write, the most glibly on said topic, whether it be in politics, morals, religion or trade, or in the deeper realm of scientific research. Yet to elaborate on a theme with the thought to bring enlightenment to the hearer or reader presupposes that the effort should come through the medium of some one who is qualified, in a fairly marked degree, to present the topic in an edifying manner; so, as there are two horns to the dilemma, I presume the safer course for me will be to grab hold of both horns and let the dilemma shift for itself. I believe this is the first time that a general discussion of the edible mushrooms of Kansas has been undertaken, and as this paper is calculated to be merely academic in scope, it is to be hoped that in the near future some one better qualified may build a worthy superstructure on the foundation that I am laying to-day.

My remarks in this paper will be confined to my own observations and experiences in this state. While we have, perhaps, more than a hundred species of edible mushrooms in Kansas, I will consider only about twenty-five of the commonest and most noteworthy species. In the United States there are more than one thousand species of mushrooms, including the puffballs, and I think it can be safely said that you can count on the fingers of your two hands all the species that are known to be violently poisonous.

In this discussion I shall confine myself to only three family groups of the fungi, viz., the Agaricaceæ, the Lycoperdaceæ, and the Helvellaceæ, or, in other words, the agarics, the puffballs, and the morels. In the first group we have the well-known common meadow mushroom, *Agaricus campestris,* of commerce, both in and out of cultivation. With its short stipe, white cap or pileus, and pink gills or lamellæ, it needs no additional description, as its range is world-wide. Out of cultivation it is usually common from May to October about old manure dumps, on lawns, in meadows and on the open prairie, growing abundantly on fairy rings. I have seen this king of mushrooms growing so abundantly on the Saline river north of Wa Keeney, on closely cropped buffalo grass, that I feel safe in saying that one day in June several years ago there could have been gathered a large farm wagonload from the tens of thousands of plants on a tract not to exceed five or six acres in extent.

Another species of this genus is *Agaricus arvensis,* the horse mushroom, which is quite similar to the meadow mushroom, but is much larger and coarser in structure, often reaching five inches in diameter. It is usually found about old barnyards and manure dumps. It usually has a double collar around the stipe instead of single as in the case of the meadow mushroom. The pileus is thick and the gills are pinkish. The flavor is excellent.

Next we come to what are popularly known as the "ink caps," which belong to the genus *Coprinus* and are very fragile, and also of very short life, as they soon deliquesce and disintegrate in bright sunlight, melting to black masses. The species of this genus are all edible and of good flavor. The maned agaric, *Coprinus comatus,* is the best known and is readily recognized by its large, drooping cap, which never fully expands. The plant is four to six inches high, growing solitary or several together, in all sorts of situations. *Coprinus atramentarius* is found in dense tufts about old stumps and like situations. The campanulate pileus is thick and meaty, furnishing a good mass of toothsome food. *Coprinus ebulbosus* and *Coprinus micaceus* follow in order. They both grow in tufts about old stumps. The former has a scurfy pileus, while in the latter it is smooth but finely striate. A species closely related to *Coprinus* is *Panæolus.* The one species in this genus worthy of note is *Panæolus solidipes,* which is three to five inches high with a solid white stipe and bell-shaped, dirty-white pileus. It is of excellent quality and is often found in fair quantities on dung in pastures following a spell of rainy weather in July or August.

Two delicate and fine-flavored species which grow mostly in groups, found in groves and places where trees have been cut off, are *Hypholoma cutifractum* and *Hypholoma incertum.* They are very similar in appearance, with the exception that in the former the pileus is cutifractate or broken, while in the latter it is smooth and unbroken. The cap is white, inclining to purplish at the edges, thin and very brittle, one and a half to three inches in diameter, with a brittle white stipe of about the same length. It is common from June to August. To my taste there are no finer agarics than *Pholiota vermiflua* and *Pholiota præcox.* They are of a good size, with a thick, plane-expanded pileus of two to three inches in diameter, on short stipe, cream-colored and viscid when young. The gills are grayish white at first, turning to a rich cinnamon brown with age. The plant often remains standing in the hot sun for several days after maturity, and becomes completely dry with but little change of form. The plants grow on cultivated ground about trees or out in the open field through May and June. In 1917, on a small tract of ground that had been sown to barley, where previously had been a plum orchard, the *Pholiota vermiflua* came up in May by the hundreds, and we were kept in fresh mushrooms every day as long as the conditions were favorable.

Cortinarius rimosus is another "best seller." Some seasons this species is found in great abundance, especially in cottonwood groves, where hundreds of them may be found in rows and curves entirely hidden beneath the old, dead leaves, which are raised up four or five inches, presenting the appearance of the runway of a mole as large as a rabbit! This fungus is of good size, two to four inches in diameter, with a grayish-white pileus of medium thickness, with light-bluish to purple-tinged gills. It grows singly or in groups of several plants united at the base. Several years ago I found this species so abundant in a cottonwood grove near our home that I brought in a buggyload every few days until the season for it had passed. Its edible qualities are close to the top of the list. *Lactarius velereus,* which in habitat is quite similar to the preceding species, is also a good edible mushroom, but usually not very abundant in this state. It is low and stocky, with thick stipe, white pileus, often depressed in the center. The flesh is quite peppery, which element passes off in cooking.

Pluteus cervinus, the deer mushroom, is a handsome edible species found in timber from May to August, on old logs, stumps and rotten wood. It is two to six inches high, with thin, very light fawn-colored pileus, two to four inches in diameter. It is common, but not abundant at any time.

The common oyster mushroom, *Pleurotus osteratus,* is found on old logs and stumps throughout the state wherever timber is grown, from June to September. It is nearly pure white throughout, sessile, and usually in laminated tufts eight to ten inches across. It must be collected when it is quite young to be of value, as it soon becomes tough and unpalatable. It is a well-flavored species and easy of recognition, even to the novice, who having once learned its form is not likely ever to forget it.

What may well be called our winter mushroom is known scientifically as *Collybia velutipes.* I have found it on old logs, stumps and buried wood in every month of the year. It is light to dark yellow or tan color, with nearly white gills, and is usually found in dense groups with many of the pilei unexpanded. It is rather tough and does not come up in texture or flavor to many other species.

The last of the agarics of which I shall speak is *Lepiota morgani,* which is by far our largest species, and is found in all parts of the state from June to August. The plant is six to eight inches high and has a somewhat scaly pileus five to ten inches in diameter. The stipe is white and graceful, with a neatly laundered collar near the top. The gills or lamellæ are white, turning to light greenish with age. It occurs on prairies and in open woodlands. This is one of our unwholesome mushrooms and its use should be avoided. Nevertheless, it has a good flavor, and I have eaten it with relish, while one member of my family was made quite sick from the same dish. Mycophagists everywhere, I believe, give it just these properties—making certain persons quite ill while others go unharmed.

Let us now turn to the puffballs. Of these, the giant puffball, *Calvatia gigantea,* is the largest and best known as it often measures twelve to eighteen inches in diameter. It is nearly smooth. It is common throughout the state and should all persons know of its esculent qualities thousands of pounds of palatable and nutritious food might be utilized which now goes to waste. This species dries to a rich brown when the spore mass breaks. The flavor is quite excellent when the plant is young, but becomes much stronger with age. *Calvatia cœlata* is another of the large puffballs with a beautifully embellished, warty top, quite unlike the preceding species. It also in breaking reveals a dense brown spore mass. Its flavor and edible qualities are similar to the giant puffball, for which it is often mistaken. Coming down the scale a little, we have two more rather large puffballs, viz., *Calvatia cyathiformis* and *Calvatia lilacina.* Both species are found in open glades and on the prairies in all parts of the state. They are readily separated from the previously mentioned species by the deep purple spore masses manifest in the ripe fungus, and by their more attractive flavor when served. The aforementioned four species constitute, perhaps, nine-tenths of the edible puffball flora of Kansas. Then come the little puffballs, such as *Lycoperdon pulcherrimum,* the beautiful, covered all over with white, bristly excrescences, *L. atropurpureum, L. wrightii,* and many others. As there are no poisonous puffballs, you are at liberty to help yourself to anything you may find. There are, however, several species which carry a rather disagreeable odor, which should be discarded as undesirable.

Last, but not least, we come to the morels, or sponge mushrooms, of which species *Morchella esculenta* is the most common and best known. It is of a dull flesh color, usually conical, deeply pitted in its fruiting parts, and rests on a thick, hollow white stipe. This species, while common throughout the United States and Canada, is seldom abundant, but when you do find it in sufficient quantity for table use, if rightly prepared, you have a dish fit for a king.

My object in this paper, is, if possible, to draw your attention to the fascinating conservation of tens of thousands of pounds of most delicious food which annually goes to waste through a lack of knowledge in knowing how to properly care for it. As to the actual food value of mushrooms the authorities differ. Some claim that of the better varieties, pound for pound, they are equal to beefsteak, while others claim that the food value is very little above that of turnips or cabbage, and that a chemical analysis discloses but a very meager food content. To the latter class belong that large company of persons who are not mushroom eaters or mycophagists. The constituent elements which are contained in the ordinary mushroom are not easy of analysis as to their intrinsic and nutritive value as a food product. Let us look at the matter from the analytical chemist's standpoint. He can take a pound of beefsteak to his laboratory and analyze it carefully, giving us in hundredths each and every constituent element contained therein, and by adding up these elements as indicated on his trial paper will give us within a fraction the round 100 per cent. Yet should he go to his shelves and from his containers take the exact amount of each element, as per analysis, and place them in a bowl and thoroughly mix, what would he have? Verily, not beefsteak; but rather would he have a dirty-looking, sloppy mass that would most probably cause a well-bred dog to put his tail between his legs and hike for a hole under the barn! Often, on "a hungry summer day," as Will Carleton says in his "Lightning Rod Dispenser," I have eaten a full meal of mushrooms with scarcely a mouthful of other food, and their staying qualities have always been as satisfactory as a full meal of bread, potatoes and meat. With me, mushrooms as a food and a relish are par excellence!

It would be foolish to contend that the medicine which the sick man takes contains food elements which restore him to his normal health, for we know that all medicines are given for the sole purpose of assisting nature to assume its functions by throwing off the disaffection. You are at liberty here to follow out the sequence.

By the brief descriptions given in this paper you will not be able to determine all the species named, so you want to know, then, how it may be done. Good! This is a rather hard proposition to set before you with any positive clearness. This knowledge must mainly be attained in the field, but it will not come down upon you like "a rushing, mighty wind," as the Spirit descended on the day of Pentecost, but rather it will take months, and perhaps years, for a fair development. Knowing the difference between a puffball and an agaric, you desire to know how to distinguish between the different species in each of these groups. The printed descriptions in the books, the big out-of-doors and the association of some one who *knows* should soon place your feet in the path to a good attainment.

You recognize your friend by his form and features; you know the difference in appearance between the figure 6 and the figure 7; the face of your friend is unlike that of any one else among your acquaintances; the figures 6 and 7 are wholly unlike and you never confound one with the other. This is the secret of the whole matter. Get on speaking terms with your fungus friends and the door of attainment will swing open before you, never to close.

The methods of preparing mushrooms for the table are various indeed, and for the best results should conform to the taste and practice of the eater. In Farm Bulletin No. 796 of the U. S. Department of Agriculture many methods of preparation are given. The canning of all sorts of mushrooms is becoming a common and most valuable practice, a full account of which is given in the bulletin also. Aside from some of the more æsthetic forms of mushroom cookery is the common, inexpensive stew, which applies to nearly all forms alike, and is as follows: Place the prepared material in a porcelain or granite stewer, with sufficient water, and boil for ten to twenty minutes, according to the texture of your mushrooms. Remove from the fire, pour off the water, replace on the fire and pour in sufficient rich, sweet milk to nearly cover the mushrooms; then season to taste with butter, pepper and salt, and let the mass again just come to a boil. Serve hot, and you will have a dish to a queen's taste.

There is a pronounced prejudice against the eating of mushrooms. Many people are afraid to have anything whatever to do with them. Guests at our own table have looked askance and with astonishment upon us as we partook of the "vile stuff," with a look on their faces as though they expected to see us in the throes of mortal agony at any moment, which always puts us in remembrance of the barbarians who thought the same thing of the Apostle Paul on the island of Melita when the viper fastened itself on his hand. It is true that many cases of fatal mushroom poisoning, through ignorance or carelessness, have occurred from the Missouri river east to the Atlantic coast, but when the good Lord staked out the territory of Kansas it pleased Him to hedge it about with such peculiar conditions that we are almost if not entirely free from poisonous species. The deadly amanitas do not seem to be a product of Kansas, as we have no published reports of their occurance in the state. *Amanita phalloides* and *A. muscaria* of the East cause, perhaps, nine-tenths of all the fatal cases of mushroom poisoning in the United States.

There is, however, one species of this genus, *Amanita prairiicola,* in western Kansas, growing in short buffalo grass on the high prairies of Phillips and Rooks counties, in August and September. The writer discovered this species in August, 1896. It is white throughout, with medium length stipe, scurfy pileus and dries solid in situ. It has a villainous appearance, and I have given it a rather wide berth. It was described by Dr. Chas. H. Peck in Bulletin Torrey Botanical Club, p. 138; 1897.

What are known as unwholesome mushrooms, such as *Lepiota morgani,* cause a very unpleasant illness very soon after being eaten, but the deadly species do not show their effects for a number of hours, or perhaps until the following day, when their action is violent and positive, leaving the patient in no doubt as to his misfortune.

No, there is no "discolored silver spoon" test or any other chemical method to distinguish between a poisonous and a nonpoisonous mushroom.

More Evidence That Platte River, Nebraska, Formerly Connected with Grand River, Missouri.

JAMES E. TODD.

As it is uncertain whether this investigation may be carried further very soon, it seems well to place on record a report of progress to date.

In preparing a paper on the Pleistocene history of the Missouri river (Science, n. s., vol. xxxix, p. 263 *et seq.*), in examining the topography of the country it was found that the steepest slope from a point near Nebraska City on the Missouri river was not along the course of the Missouri, but southeast to the vicinity of Stanberry, on Grand river, Missouri. Attention was called to the fact, and the theory was proposed that preceding the Kansan stage of the great glacier the drainage was southeastward rather than along the line of the present Missouri.

Another fact was recalled that in the preparation of Bulletin 158 of the United States Geological Survey, reference had been made to the report of the United States engineers for 1890, which stated that a deep preglacial channel had been discovered near Nebraska City. As no other similar case was found at the time of publication of said Bulletin 158, it was judged more probable that some Pennsylvanian strata had been mistaken for till and glacial gravels.

With a map of the region in hand, it will be noticed that there is a branch of the Grand river rising near Platte river, Missouri, and flowing southeast.